

# Determinants for the Attraction of Urban Dairy Farm Investment in Mekelle City, Ethiopia

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## Abstract

This study addressed the urban dairy farm investments in Mekelle city, Tigray Regional State, Ethiopia. Its main objective was to analyze the factors for urban dairy farm investment attraction in Mekelle city. Quantitative primary data was collected through structured questionnaire from a sample of 59 dairy farmers selected by using proportionate simple random sampling. Analysis was conducted by using ordinal logistic regression model. Thus, age, year of experience, access to finance, health care service, training, distance, infrastructure and governmental policy were found to be statistically significant determinants of the urban dairy farm investment attraction. Therefore, the government and other stakeholders should motivate dairy farm investors by giving training on business issues; arrange trade fares, forums and exhibitions for experience sharing; and address the prevailing finance problems, infrastructure challenges, and dairy inputs, among others. Finally, future researchers are suggested to carry out large scale and in-depth studies to identify factors affecting the overall attractiveness of urban dairy farm investment in other part of Tigray region there by to develop appropriate strategies for the development and attraction of dairy farm investment.

**Keywords:** Chi-Square, Cooperatives, Determinant Factors, Dairy Farm, Investment, Mekelle City, Ordered Logit, Small Holders.

## 1. Introduction

The study was attempting to analyze the common assumption that dairy investor's leads to be more attracted to invest in dairy farming by examining what countervailing processes may affect dairy investment sector.

Ethiopia holds large potential for dairy development due to its large livestock population; the favorable climate for improved, and the relatively disease-free environment for livestock. Given the considerable potential for smallholder income and employment generation from high-value dairy products, development of the dairy producers in Ethiopia can contribute significantly to poverty alleviation and increased employment opportunity in the country.

The development of dairy in Ethiopia indicates that there is a need to focus interventions more coherently. Development interventions should be aimed at addressing both technological gaps and marketing problems. Integration of crossbred cattle to the sector is crucial for dairy development in the country. This can be achieved either through promotion of large private investment to introduce new technology input supply and output in the sector such as improved genotypes, feed and processing, or promotion of integration of crossbred cattle into the smallholder sector through improving their access to improved cattle breeds, veterinary service, and credit. Similarly, government should also take the lead in building infrastructure and providing technical service to dairy cooperatives (Yusuf, 2008).

Mekelle's ability to attract investment is to a large extent tied to Ethiopia's business and investment climate. Investment into Ethiopia grew with the liberalization of the economy in the early 1990s and the current government is seeking to eliminate further constraints on investment by establishing an enabling environment for investors. The liberalization of the economy has led to improved incentives and better marketing of the country. The regional government expands infrastructure and energy sectors have also begun attracting for investment. The privatization has proven problematic in large part due to the competing claims for allocation of land titles by regional authorities, having learned from past experiences (Bryant, 2009).

Thus, this study examines the determinants of urban dairy farm attraction by focusing on the three categories of dairy business type (i.e., small holders, cooperatives, and investors).

## 2. Statement of the Problem

Over the last decade following the political changes in 1991, the dairy sector in Ethiopia has shown considerable progress. Total milk production grew at an estimated rate of 3 percent as compared to 1.8 percent during the period of 1975-1992 (AS IFPRI, Washington, DC), thus ending the long-time trend of declining per capita milk production in the country. The dairy sector in Ethiopia is expected to continue growing over the next one to two decades given the large potential for dairy development in the country, the expected growth in income, increased urbanization, and improved policy environment. The shift towards market economy is creating large opportunity for private investment in urban and peri-urban dairying (Staal, Pratt, & Jabbar, 2008).

The existing excess demand for dairy products in the country is expected to induce rapid growth in the dairy sector. Factors contributing to this excess demand include the rapid population growth (estimated at 3 percent annually), increased urbanization and expected growth in income. With the shift towards market economy and liberalization policies, private entrepreneurs are expected to respond to the increased demand through increased investment in dairying and milk processing. While the response of the private sector to the increased demand for dairy is expected to be significant, the small-scale household farms, cooperatives and investors in the highlands hold most of the potential for dairy development (Staal et al., 2008).

Formal milk markets are particularly limited to peri-urban areas. However, unlike the early phases, the formal market appears to be expanding during the last decade with the private sector entering the dairy processing industry. And the dairy farm industry needs a commitment from the government as well as concerned bodies to invest in dairy business to fill the gap between need of the society and supplies of dairy by giving different attractive supports to smallholders, cooperatives and investors (Tubetov, Musshoff, Kellner, 2012).

**Table 1. Number of registered dairy farmers and actual in operation**

Type of Business	Number of registered in ten years (from 2003-2013)	Actual in operation	Variation
Smallholder	104	85	19
Cooperatives	57	48	9
Investors	89	13	76
<b>Total</b>	<b>250</b>	<b>146</b>	<b>104</b>

Source: Mekelle City Investment Office (2014)

Table 1 above shows that the number of investors registered (small holder, cooperatives and investors) in the past ten years and the actual investors in operation have a difference. Despite the government incentives in the form of operational land provision, financial credit, supply of dairy cows, training and technical support, and favorable investment policy in agriculture, **why the registered dairy farmers failed to commence operation?** Therefore, this study was intended to analyze the determinant factors for the urban dairy farm investment's level of attraction (high attraction, medium attraction and low attraction) for both the three dairy investments (small holder, cooperative and investors).

## 3. Literature Review

Ethiopia is believed to have the largest livestock population in Africa. This livestock sector has been contributing considerable portion to the economy of the country, and still promising to rally round the economic development of the country. The total cattle population for the country is estimated to be about 53.99 million. Out of this total cattle population, the female cattle constitute about 55.48 percent and the remaining 44.52 percent are male cattle. On the other hand, the results obtained indicated that 98.95 percent of the total cattle in the country are local breeds. The remaining are hybrid and exotic breeds that accounted for about 0.94 percent and 0.11 percent, respectively (CSA, 2012/13).

Dairying is practiced almost all over Ethiopia involving a vast number of small or medium or large-sized, subsistence or market-oriented farms. Based on climate, land holdings and integration with crop production as criterion, dairy production systems are recognized in Ethiopia; namely the rural dairy system which is part of the subsistence farming system and includes pastoralists, agro-pastoralists, and mixed crop-livestock producers; the peri-urban; and urban dairy systems (Sere & Stein, 1995).

Urban dairy farming is a system involving highly specialized, state or businessmen owned farms, which are mainly concentrated in major cities of Ethiopia. They have no access to grazing land. Currently, a number of smallholder and commercial dairy farms are emerging mainly in the urban and peri-urban areas of the capital and most regional towns and districts. Smallholder rural dairy farms are also increasing in number in areas where there is market access (Tsehay, 2009).

Thus, the empirical evidences so far conducted on the determinant of dairy farm investment are reviewed in this section as studies in other countries and studies in Ethiopia.

### 3.1 Empirical Studies in Ethiopia

Empirical researches so far conducted on the determinants factors of dairy farm investment in Ethiopia are reviewed in this section:

Belay, Yisehak, and Janssens (2012) in their research title “Socio-Economic Factors Influencing Urban Small-Scale dairy management practices in Jemma town, Ethiopia” have reported that age, family size, education, gender, marital status, landholding (landless or leased), owner’s occupation, main sources of income, second sources of income and experience in dairy farming are the determinant factors affecting urban dairy farmers attraction.

Belay et al. (2012) also revealed that the dairy production was mainly a male domain (75.9%) whereas only 24.1% were female. Majority (96.3%) of the respondents had no land and dairying is a backyard activity in the compound of the households. Few households (3.7%) leased out a small area of land from government. Lack of land was one of the major problems reported by the respondents to dairy improvement in the study area. 79.6% of the income from dairy production was mainly used for purchasing food items, and covering education and health expenses. Besides, there the study showed that age, family size, level of education and years of experience in dairy production were significantly correlated to dairy management practices; and level of education, culling practice and family size, level of education and experience in dairying, method of manure disposal and experience in dairying, traditional animal treatment and family size, and milk production with level of education.

Getachew, Medhin, and Getnet (2012) stated that among the constraints of dairy farm business are high disease prevalence of zoonotic livestock diseases, lack of aggressive livestock disease control, lack of effective quality control at different stages of milk production and transaction, lack of efficient liquid milk collection and cooling facility and transportation means to processing sites, poor infrastructure, road access ,under developed milk processing and marketing system, lack of enforcement of quality control regulations and standards.

Dehinenet , Mekonnen, Kidoido, Ashenafi, and Guerne (2014) reported that the factors influencing adoption of dairy technology on small holder dairy farmers are sex of the household head, family size, distance to market center, distance from agricultural development center, education level of the household head, age of the household head, off-farm activity participation, land holding, access to credit service, access to dairy production extension service, farming experience, availability training services, availability of veterinarian /animal health service, cross breed cows and feed supply.

Melesse, Jemal, and Melesse (2012) stated that the determinant factors affecting the level of adoption of dairy farm are religion of the household, educational levels of the household head, family size, starting period of dairy production, herd composition, adoption of different dairy technologies, cost of heifer and cow during adoption, type of dairy animals adopted first and mating system.

Therefore, based on the empirical evidence reviewed above, the determinant factors for the dairy farm investment in Ethiopia are identified as personal characteristics factor (the household head age, educational levels of the household head, family size, years of experience in dairy production, sex of the household head, off-farm activity participation, dairy management practices);dairy animal related factors (herd composition, type of dairy animals adopted first); production related factors ( lack of efficient liquid milk collection, starting period of dairy production, milk production standards, lack of effective quality control regulations and transaction); market related factors ( cost of heifer and cow during adoption, distance to market center ); technology factors (cooling facility, mating system, adoption of different dairy technologies);finance (access to credit service); infrastructure factors (poor infrastructure); access to land ( land holding); health care factors (availability of veterinarian /animal health service, lack of aggressive livestock disease control); training related factor (access to dairy production extension service, availability of training services); fodder (feed supply).

### **3.2 Empirical Studies Outside Ethiopia**

The empirical researches so far conducted on the determinants factors of dairy farm investment outside Ethiopia are reviewed in this section.

Financial constraints (Gabel, Sinclair, & Desgagné, 2010; Hu & Schiantarelli, 1998) and non-monetary intentions of the decision maker (Ison & Russell, 2000) are found among the factors contributing for dairy investment reluctance.

A study conducted by the Kazakhstani governmental marketing company, KazAgro-Marketing, explained the investment reluctance by high level of risk associated with modern dairy farming. The high level of risk in modern dairy farming is caused by demand shocks, the seasonality of fresh cow milk production, the absence of price-stabilizing policies, and animal diseases (KAM, 2009).

VanEngelen (2011) also posited limited capital access as one of the main factors that lead to a low level of investment in dairy farming capital access, production parameters and managerial abilities, risk attitudes of farmers and instability on the dairy market, non-monetary goals (lifestyle) consideration; family tradition),bounded rationality, diffusion theory(low innovation readiness of farmers in complex with slow diffusion of information about new technologies among Capital access is one of the main factors that lead to a low level of investments in dairy farming. Capital access, production parameters and managerial abilities, risk attitudes of farmers and instability on the dairy market, non-monetary goals (lifestyle considerations; family

tradition), bounded rationality, diffusion theory (low innovation readiness of farmers in complex with a slow diffusion of information about new technologies among farmers) and path dependency describe the investment behavior of Russian farmers. This study confirmed that a more risk-averse farmer is more reluctant to make an investment decision (Tubetov et al., 2012).

Halak (2012), in his research title “quality management and socio-economic factors as determinants of dairy investment farmers’ productivity”, identified the main determinant factors that affect the business. Some of them are access to credit, farmer participation in groups, the level of quality management of a dairy farmer, the social demographic factors of age, education, gender of a farmer, the government policies and other intervention measures as prescribed by the authorities.

Shamsuddoha and Edwards (2008) have discussed the present situation and future prospects of the Bangladesh dairy industry. Their analysis first provided an overview of the importance of the industry and the current problems facing the industry, later, the need for government intervention in the industry is highlighted, and finally, government programs for the industry. Market failures and government failures in dairy production and marketing are the main cases for conducted this research by the authors.

Shamsuddoha and Edwards (2008) also stated that the determinant factors (causes) of market failures and government failures in dairy production industry and marketing in Bangladesh are information problems, lack of disease/parasites control (externalities), shortage of quality breeds (incomplete market), shortage of cattle feed (incomplete market), lack of research and training (public goods), lack of national milk grid and processing plants (public goods) and inefficient marketing. The marketing effort has to be recognized not so much as a sales activity but as an essential pre-requisite for ultimate milk production. As indicated earlier, the absence of an efficient market is a problem for feed inputs as well as for the industry’s output of milk.

Beside the above determinant factors, they were also mentioned ways of correcting market failure and government failure. It is suggested that the following policies can be recommended so that available resources, physical facilities and technological progress are utilized for developing the dairy industry; government involvement in the development of dairy industry, remedies for Market Failure Policy Measures (Technical policies include breeding policy, Veterinary program, Information and extension services, and from the economic policies include Production policies, Marketing structure and trade policies) (Shamsuddoha & Edwards, 2008).

Finally, due to lack of research and extension services, it has not yet been demonstrated that dairy farming industry can be transformed into an attractive and profitable investment business. In addition, there is a lack of trained personnel at all levels as well as a lack of training facilities, the marketing effort has to be recognized, and there should be institutional support for the dairy industry to resolve the above problems (Shamsuddoha & Edwards, 2008).

Sikawa and Mugisha (2011) have studied factors influencing dairy farmers’ choice of milk marketing channel in Kirihura district, south-western Uganda. It was an attempt to establish factors which influence dairy farmers’ choice some of them are the milk marketing channel in the district milk prices, farm size, and volume of milk produced, number of milking animals, marketing channels, and household demographic characteristics.

Mosnier and Wieck (2010) reviewed studies analyzing the determinants of spatial dynamic dairy production. The review distinguished three dimensions that may contribute to spatial dynamics: farm level determinants related to factor endowment, technology, and production costs; developments and differences at the dairy sector level; and spatial differences in public policy. Spatial dynamics is influenced by both, structural change and regional production change. Still, research analyzing both issues in context are still scarce. They argued that research focusing on the co-evolution of farm structure and regional production could help to better encompass regional production change dynamics.

Lieve, Vandermerch, and Mathijs (2001) reported that the determinant factors for the dairy farm are categorized in to six. These are 1) economic factors: expected profitability and financial situation expected profitability, farm size, increase in milk yield per cow, financial situation; 2) non-economic factors: human capital, labor and social welfare: labor, schedule, nature of the work and work climate, human capital, strategic plan of the farm; 3) Animal welfare and environmental considerations: cow health and welfare, replacement rate, selection, energy consumption and environment; 4) risk considerations; 5) dynamic considerations; and 6) institutional constraints.

Halak (2012) classified the determinant factors of business in to five groups: 1) social demographic factors: age, gender & education of a farmer; 2) credit facilities: access to loan facilities, terms & conditions, lending process, loan duration; 3) quality management levels: organizational culture, capacity of human resource, technology usage, staff trainings, service hours taken; 4) farmer participation in groups: information use, extension service, inputs available; and 5) Government policies & other interventions.

Cabrera, Daniel, and Corral (2010) stated that the determinate variables for effect of practices in the efficiency of dairy farms included milking system, housing, milking frequency, family labor, feed/cow and pasture.



Michaličková and Krupová (2014) stated that the determinants of economic efficiency in dairy cattle are number of cows, purchase of feed, market price of milk, production overhead cost, management overhead cost, repairs and services, depreciation of tangible property, animal performance (e.g. milk yield, number of sold lambs), price of the main inputs (feeds, other direct costs, labor and depreciations), market price of products along with the value and type of subsidies are the most important determinants of economic efficiency in dairy cattle farms.

Monika, Zuzana, and Emil (2013) in their study on strategies of disadvantage mountain dairy farmers as indicators of agricultural structural change: case study of Murau, Austria identified the determinants factors are total feed costs, material costs, labor costs, repair and service, depreciation, and other direct costs and overhead costs.

Arinaitwe and Bua (2008) in their research on factors influencing the strategic decision to further develop dairy production - a study of farmers in central Sweden stated that the determinant factors of milk production were breed type and age of the cow, quality of feed, management and environment.

Jaisridhar, Sankhala, Kadian, Kumar, and Sangeetha (2013) found that the factors determining adoption of scientific dairy farming are gender, educational status, operational land holding, milk production, total annual income and information.

Abdulkareem, Al-Sharifi, Eidan, and Sasser (2012) found that the determinants factors for milk yield in cross breed dairy cows on small hold farmers are sharing behavior, breeding, feeding, management, health care and fodder production, herd size category, source of labor (family labor or hired), calf rearing method (bucket or partial sucking), parity number of cows and dairy milk yield.

According to FAO (2006), the factors affecting milk production in goats are categorized in six groups. These are genetic factors (breed differences and selection, inbreeding, crossbreeding, new genetic technology), physiological factors (age, seasonal influence, multiple births, length of lactation and dry period), milking management (the use of a milking machine, milking frequency and milking intervals), fertility management (breeding season, the influence of male goats, age at first breeding), kid rearing (prolificacy, kid survival, kid rearing systems) and Nutrition (Nutrient Requirements, Feeding Systems).

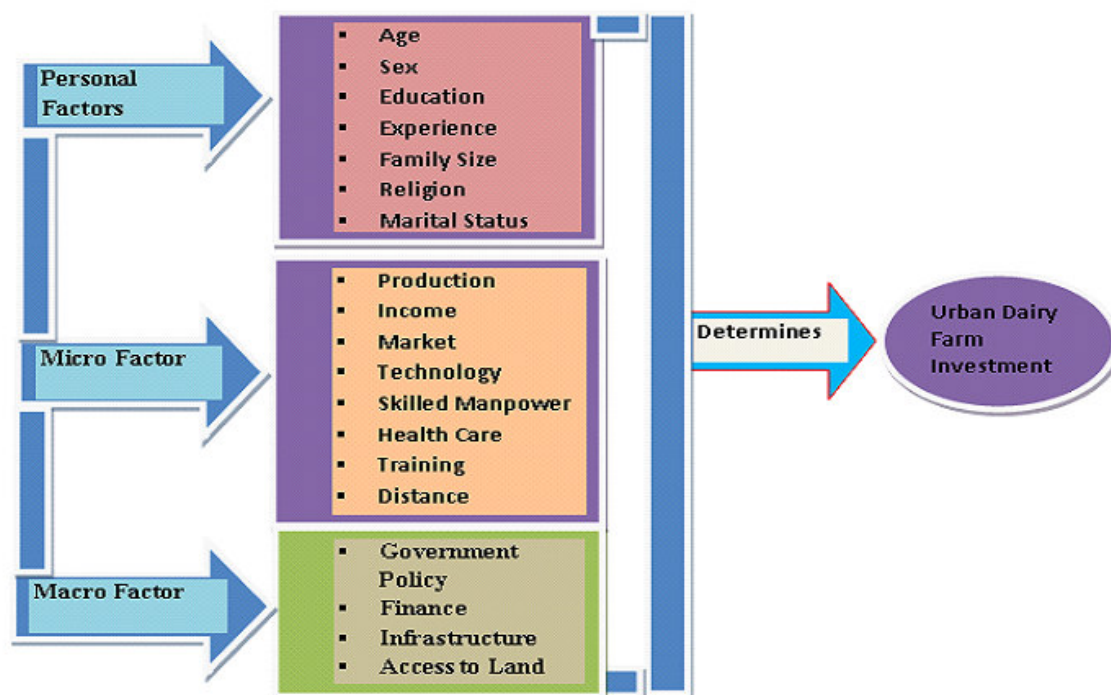
Kevin (2011) explained that the factors impacting dairy profitability variables are included herd size, milk production (pounds per cow per day), milk price (profit regression only), cull rate, feed as a percentage of total cost, percentage of farm labor allocated to livestock, and years included in the multi-year average.

Therefore, based on the empirical evidence reviewed above, the determinant factors for the dairy farm investment outside Ethiopia are summarized as personal characteristics factor (religion of the household head, educational levels of the household head, family size); dairy animal related factors (herd composition, herd size, age of the cow, animal performance (e.g. milk yield, number of sold lambs, housing, number of milking animals, shortage of quality breeds), the influence of male goats, age at first breeding); production related factors (milk production, cull rate, source of labor (family labor or hired), material costs, labor costs, repair and service, other direct costs and overhead costs, milking system, milking frequency, volume of milk produced, available resources, high level of risk associated with modern dairy farming, starting period of dairy production); market related factors (cost of heifer and cow during adoption, milk price, feed total cost, market price of milk, price of the main, market information use, marketing channels, inefficient marketing, inputs availed); fodder related factor (quality of feed, fodder production, nutrient requirements); health care factor (animal diseases, health care); training factor (extension service, lack of research and training); managerial practice factor (feeding management, milking management, milking frequency and milking intervals, fertility management like breeding season, kid rearing like prolificacy, kid survival, management and environment, quality management levels, the high level of risk in modern dairy farming); technology related factor (lack of national milk grid and processing plants, kid rearing systems, the use of a milking machine, adoption of different dairy technologies, feeding systems); finance related factor (credit facilities); skilled man power factor (percentage of farm labor allocated to livestock); land access factors (operational land holding); income related factor (total annual income); government policy factor (remedies for market failure policy measures, marketing structure and trade policies, government policies & other interventions, government involvement in the development of dairy industry, the absence of price-stabilizing policies).

### 3.3 Conceptual Framework

The following dairy farming conceptual framework is drawn from the empirical literature reviewed above (researches conducted in Ethiopia and outside Ethiopia) in order to show the relationship between the dairy farm investment attraction (**dependent variable**) and its determinant factors (**independent variable**) (**Figure 1**).

**Figure 1 Conceptual Framework**



**Source:** Adapted from Abdulkareem et al. (2012), Dehinenet et al. (2014), and Shamsuddoha and Edwards (2008).

#### 4. Research Objective

The objective of the study was to identify and analyze the determinants of urban dairy farm investment attraction in Mekelle city, Tigray.

#### 5. Materials and Research Methodology

##### 5.1. Description of the Study Area

The Ethiopia is administratively divided into nine national regional states and two administrative councils. The Tigray National Regional State (TNRS) is one of the nine National Regional States, with Mekelle as capital of TNRS. The city of Mekelle was established in the 1870s, and selected as Ethiopia's capital by Emperor Yohannes. Previously, it had been the site of several small settlements. The city's strategic location in a large valley in the Ethiopian highlands placed it at the crossroads of the ancient salt trade in the Afar region to the east, and within easy access of the Red Sea, 200 km to the northeast (Cannon, 2009).

Mekelle is the sixth largest city in Ethiopia and the capital of Tigray State. It is located approximately 780 km from the capital, Addis Ababa, in the Ethiopian highlands. Mekelle city enjoys a mild highland climate with an average temperature of 25°C. The rainy season in Mekelle city is from June to September, while the dry season is from October to May. The average annual rainfall is approximately 579mm (KPMG International, 2010).

According to the 2007 census, the population of Mekelle was 215,546 of which 51.3 were Women. The 2013 census population, assuming a 5.4 percent growth rated, is projected to reach around 300,000 (Millennium Cities Initiative [MCI], 2011).

The city also has an airport, the Alula Abanega international Airport, which offers several daily flights to Addis Ababa and other locations in Ethiopia. It also has cargo cold-storage facilities that are very useful for perishable export cargo (MCI, 2011).

##### 5.2. Research Methodology

###### 5.2.1. Research Approach

For a similar study, Belay et al. (2012), and Sikawa and Mugisha (2012) have applied both descriptive and explanatory research approach; however, Halak (2012), and Dehinenet et al. (2013) have applied explanatory approach. Therefore, this study has applied an explanatory approach for the quantitative data collected through questionnaire.

###### 5.2.2. Data Type and Data Source

For a similar study, Melesse et al. (2012), and Sikawa and Mugisha (2012) have used both primary and

secondary data, and cross sectional type. However, Belay et al. (2012) have used primary data and cross sectional type. Therefore, this study has collected primary quantitative data through questionnaire from the sampled smallholders, cooperatives, and investors.

### 5.2.3. Sampling Design

According to similar empirical studies, Halak (2012), Getachew et al. (2012), and VanEngelen (2011) employed simple random sampling; and Belay et al. (2012) applied a single-visit-multi-subject formal survey technique.

This study was conducted in Mekelle city Tigray region. A two-stage sampling procedure was adopted for the study. The first stage was the selection of sample for each business type. The second stage was the selection of sample respondents from the selected sample. Finally, a sample size of 5 from investors, 19 from cooperatives, and 35 from smallholders proportional to the group numbers in each business type were randomly selected from the list of individuals and cooperatives provided by the Mekelle City Investment Office (2014).

In order to get adequate and representative sample of respondents, the sample size was determined by using the following used for finite population (Yamane, 1967). The reason for using this sampling method was that the sizes of the attraction of dairy farming are known. Among the several method of sample size determinations to determine the required sample size is at 90% confidence level and level of Precision = +10%, this means that, if a 90% confidence level is selected, 90 out of 100 samples have the true population value within the range of +10%, precision (sampling error).

$$n = \frac{N}{1 + N(e)^2} \dots \dots \dots (1)$$

$$n = \frac{146}{1 + 146(.1)^2} = 59$$

Where,

n = sample size; N = population size (targeted population); e=sampling error/level of precision = 10%.

Based on the above formula, the proportionate sample size of investors, cooperatives, and smallholders was calculated as follows (Table 2):

**Table 2. Determination of Sample Size**

S/N	(A)Business Type	(B)Number of groups /population/	(C) Sample size $n = \frac{5 \times 59}{146}$
1	Investors	13	5
2	Cooperatives	48	19
3	Small holders	85	35
<b>Total</b>		<b>146</b>	<b>59</b>

**Source:** Mekelle City Investment Office (2014).

In summary, the study was made by using simple random sampling because it is considered the simplest, most convenient and bias free selection method. It enables every member of the population to have an equal and independent chance of being selected proportionately as respondents (Yamane, 1967). The study considered 40.41% (i.e., 59/146\*100%) sample size of the target population chosen from each of the group (business type) whereby the target population was divided into three business types. This ensured that all the business types within the study area were included in the study.

### 5.2.4. Data Collection Instrument

As per a similar study, Sikawa and Mugish (2012) have employed structured questionnaire; and Halak (2012) employed both structured and unstructured questions.

The aim of this research was to assess the determinant factors that affect the attraction of urban dairy farm investment in Mekelle city. In order to answer the research questions, primary data was used. The primary quantitative data was collected through structured questionnaire. The questionnaire was pre-tested to evaluate for consistency, clarity, avoiding duplication, and to estimate the time required during data collection. On the basis of these comments, the questionnaire was modified. Accordingly, questions were asked about the determinant factors that affect the attraction of urban dairy farm investment.

### 5.2.5. Data Processing and Analysis Technique

For a similar study, Belay et al. (2012) has applied descriptive statistics, and probit model; and Sikawa and Mugisha (2012) generate descriptive statistics and applied a multinomial logistic regression model.

Therefore, this study has applied Ordered Logistic Regression Model in order to analyze the probability and marginal effect of the explanatory variables on the attractiveness of dairy investment (dependent variable). Accordingly, the collected data was edited, coded, and classified carefully checked for completeness and

consistency in order to make them ready for analysis by using STATA version12.

The **Ordered Logistic Regression Model** was applied to examine the factors that determine the dependent variable (attraction in dairy farm investment) and empirical based explanatory variables such as **demographic factors** (age, sex, education, experience, family size, religion, marital status), **micro factors** (production, income, market, technology, skilled manpower, health care, training, distance), and **macro factors** (government policy, finance, infrastructure, access to land). The ordered logistic regression model was employed for its appropriateness in order to examine the factors affecting the attraction of private investment in dairy farm where the ordinal dependent variable has a natural order (Verbeek, 2008).

#### Model Specifications

Attraction on dairy farm investment is the dependent variable, while the different influencing factors, i.e., **demographic factors** (age, sex, education, experience, family size, religion, marital status), **micro factors** (production, income, market, technology, skilled manpower, health care, training, distance), and **macro factors** (government policy, finance, infrastructure, access to land) were considered as independent variables. The dependent variable was measured as 1 (**low attractive**), 2 (**medium attractive**), and 3 (**high attractive**); where the reference group is “high attractive”.

Therefore, attraction on dairy farm investment is treated as three category dependent variable (i.e., low, medium, and high attractive). It is a non-continuous dependent variable that does not satisfy the key assumptions in the linear regression analysis. To examine the factors affecting the dairy farming, discrete choice model should be used. Thus, the most widely used and appropriate qualitative response models are the logit and probit models (Verbeek, 2008).

Accordingly, in this study, the ordered logistic regression model was used to analyze the factors influencing for the attraction of dairy farming. The ordered logistic regression model depends up on the idea of the cumulative logit. This in turn relies on the idea of the cumulative probability. Therefore, we can think of the cumulative probability  $C_{ij}$  as the probability that  $i^{\text{th}}$  individual is in the  $j^{\text{th}}$  or higher category. Thus, the ordered logistic regression model is specified as follows:

$$\text{Logit}(C_{ij}) = \alpha_j - \beta x_i \quad \dots \quad (2)$$

Note that there is a different intercept for each level of the cumulative logit, but that  $\beta$  does not vary by the level of the cumulative logit. Also note that  $\beta$  is subtracted rather than added. This means:

- Each  $\alpha_j$  indicates the logit of the odds of being equal to or less than category  $j$  for the baseline group (when all independent variables are zero). Thus, these intercepts will increase over  $j$  these intercepts are sometimes referred to as cut points.
- The  $\beta$  tells us how a one-unit increase in the independent variable increases the log-odds of being higher than category  $j$  (due to the negative sign). Because, this  $\beta$  is not indexed by  $j$  we are assuming that the one unit increase affects the log-odds the same regardless of which cut-point we are considering.
- $X_i$  refers to the explanatory variables that are described below as follows:

$X_1$ (age): age of the respondent member

$X_2$  (sex): gender type of the respondent member

$X_3$  (educlevel): the educational background of the group members.

$X_4$ (yearofexprie): dairy farmer’s years of experience in dairy production.

$X_5$ (famsiz): number of household members in family.

$X_6$ (relig): religion of dairy farmer.

$X_7$ (marstatu): marital status of dairy farmer.

$X_8$ (product): the amount milk and related products that farmers produce.

$X_9$ (income): the amount generates by the farmers/investors/.

$X_{10}$ (mkt): the dairy market situation.

$X_{11}$ (techno): use of sophisticated dairy technologies.

$X_{12}$ (skimanpower): availability of skilled man power that operates the dairy farm.

$X_{13}$ (healcar): access of health care service for the dairy animals.

$X_{14}$ (trairela): accesses of training related to the dairy operation.

$X_{15}$ (dis): distance from output and input market.

$X_{16}$ (govpoli): the government rule and regulation on dairy farming.

$X_{17}$ (finan): access to credit /finance/ for the dairy farming.

$X_{18}$ (infrastruc): access of infrastructure facility on dairy operation.

$X_{19}$ (acceoperatland): access of operational land for dairy operation.

Before applying the ordinal logistic regression model, a measure of model fit for ordinal logistic regression model, which is the Hosmer-Lemeshow test of goodness of fit was used to see how well the model fits the data. Hosmer-Lemeshow’s goodness of fit test shows how much predicted values match closely the observed values. This test states that the more closely the observed frequencies and predicted frequencies matched, the better the fitness of the model. This test is more appropriate test for ordinal logistic model (Hosmer



& Lemeshow, 1980).

To test goodness fit of the model “*lfit*” has been conducted. There are no fixed points as to judge the model as a best or bad predictor yet it is generally agreed that a model with its overall predictive power of **three percent or more** is good (Anders, Ari, & Magnus, 2006). As indicated in **Table 3**, the result of the test indicates the p-value (0.6215) is greater than 0.05 Therefore, the null hypothesis (i.e.,  $H_0$ : The model fits the data well) is accepted. Which means that the goodness fit of the model is fitted with the null hypothesis result.

To detect the data problem for heteroskedasticity, multicollinearity, specification bias and normality tests (i.e., *hettest*, VIF test and OV test), respectively, were conducted.

Multicollinearity problem is the existence of a “perfect,” or exact, linear relationship among some or all independent and explanatory variables of a regression model (Gujarati, 2004). Multicollinearity diagnostics test was done to check the presence of high collinearity among and between the dependent and each independent variable. In order to test the existence of multicollinearity problem, the Pearson correlation matrix was utilized (‘*pwcorr*’). As a general rule multicollinearity is a problem when the correlation result is above 0.80 and below -0.80 (Stock & Watson, 2007). Moreover, Variance Inflating Factor (VIF) was used to check for multicollinearity problem among and between continuous and discrete variables. Chatterjee, Hadi, and Price (2000) set the general rule for multicollinearity to be a severe problem, if the mean value of VIF exceeds 10 and falls below one (i.e.,  $1 < \text{mean VIF} < 10$ ). However, as indicated in the **Table 3**, VIF result shows that there is no perfect collinearity among and between explanatory variables because the VIF value is 1.60, only multicollinearity can be a problem if and only if VIF value exceeds 10. Furthermore, multicollinearity diagnostics test was done to check the presence of high collinearity among and between the dependent and each independent variable. In order to test the existence of multicollinearity problem, Pearson correlation matrix was utilized (‘*pwcorr*’). As a general rule multicollinearity is a problem when the correlation result is above 0.80 and below -0.80 (Stock & Watson, 2007), however, as it is shown in the **Table 3** the value is under 0.2364 and above -0.2724.

The other assumption of the CLRM is the disturbance term  $U_i$  appearing in the regression function is homoskedastic. That is they have the same variance ( $E(U_i^2) = \sigma^2$  where  $i = 1, 2, \dots, n$ ). Test of heteroskedasticity says the null hypothesis that the variance of the residuals is homogeneous. If p-value is very small, i.e.,  $Pr < 0.05$  (at 95% confidence), the null hypothesis will be rejected and accept the alternative hypothesis that the variance is not homogenous (Gujarati, 2004).

The “*hettest*” was used to check whether there is heteroskedasticity problem or not. The “*hettest*” was used to check whether there is homoscedasticity problem or not. As Breusch-Pagan/Cook-Weisberg test shows in the following **Table 3**, the null hypothesis (i.e.,  $H_0$ : constant variance) is accepted at 10% level of significance, because the test result showed P-value of 0.079, which is less than the significance level (10 percent). The robust regression is carried out and used to avoid the heteroskedasticity problem in the model. Therefore, the result indicated that there is equal variance among the error terms. Therefore, there was no problem of heteroskedasticity in the process of model specification and the model was well fitted.

Furthermore, the Ramsey RESET test, “*ovtest*” has been used to check whether the model has omitted variables or not. It tests the null hypothesis that  $H_0$ : model has no relevant omitted variables. As a decision rule according to Ramsey RESET test, a model specification is fit or no omitted variables and ready for analysis if P-value stated in  $P > F$  greater than the chosen level of significances, i.e., 1 percent, 5 percent and 10 percent. Additionally, the robust regression is carried out and used to avoid the aforementioned problem in the data. The various goodness-of-fit measures validate that the model fits the data well. Therefore, in this study as shown in **Table 3**, the result indicated that the model has no relevant omitted variables since the test failed to reject the hypothesis, i.e.,  $\text{Prob.} > F$  of 0.2250 is found greater than 10 percent significance level of the specified model of the study.

In general, the ordinal logistic regression model was tested for its fitness by using *lfit*, *hettest*, *ovtest*, *pwcorr* and VIF, and thus, found fit for analyzing the factors that determine the attraction of urban dairy farm investment of the sector. Table 3 below shows summary of the logit regression model test for its fitness by using *lfit*, *hettest*, *vif*, *pwcorr* and *ovtest* and that was found fit for analyzing the factors that influence urban dairy farm investment attraction.

**Table 3. Summary of Model Specification Test Results**

Tests	Test Names	Null Hypothesis	$Ch^2/F$ -value	$\text{Prob} > ch^2/F$ -value
<b>lfit</b>	<i>Hosmer-Lemeshow</i>	Model fits data	6.43	0.5989
<b>hettest</b>	<i>Breusch-Pagan/cook-Weisberg</i>	Constant variance	3.09	0.0790
<b>pwcorr</b>	Minimum = -0.3892	Maximum = 0.2985		
<b>ovtest</b>	<i>Ramsey RESET</i>	No omitted variables	2.14	0.1089
<b>vif</b>	Minimum = 1.14	Maximum=0.2985	Mean= 1.57	

Source: Own Survey (2014)

### 5.3. Hypotheses and Definition of Variables

Based on the empirical literature reviewed, the explanatory variables selected for this study were broadly categorized under demographic, micro, and macro factors as specified above. A brief explanation of the explanatory variables selected for this study and their likely influence on the attraction of private investment in dairy farm are presented below.

#### 5.3.1. Dependent Variable

The dependent variable for the multinomial logistic regression model is the dairy farm investment attraction defined as 1 (**low attractive**), 2 (**medium attractive**), and 3 (**high attractive**); where the reference group is “high attractive”.

#### 5.3.2. Independent Variables

The independent variables used in this study were based on the empirical literature reviewed. The hypotheses for the factors and their priori effect are presented as follow:

##### Demographic Factors

The demographic factor is composed of factors related to the respondents’ age, educational level, family size, year of experience in dairy production, sex, religion, and marital status.

##### Age of the Respondent (age)

Age of the respondent is believed to be positively related with attraction of dairy farm investment. This is noted that with increase in age the respondent may acquire stability as well as a business experience (Dehinet et al., 2014). Relatively older farmers are assumed to be more experienced and risk avert due to social and personal characteristics, than younger dairy farmer. Therefore, it is believed that as the age increases it is least likely to fall in bankruptcy. Age is a continuous variable.

**X<sub>1</sub>: Older dairy farmer has a positive effect on the dairy farming because he/she is more experienced.**

##### Sex of the Respondent (sex)

This is a dummy explanatory variable that assumes a value of 1 if the sample farmer is male and 0 otherwise. It is expected to have positive impact on attraction of dairy farming (Sikawa & Mugisha, 2011).

**X<sub>2</sub>: Female dairy farmers have positive effect on attraction of dairy farming.**

##### Educational Background of the Respondent (edulevel)

It is also hypothesized that as educational level increases from primary to secondary and tertiary level, this stems from the assumption that those who have attended more of formal education than who have not shall plan and evaluate their business well. It was found that more educated beneficiaries tend to use dairy farming for the intended purpose than less educated or non-educated farmers (Jaisridhar et al., 2013). Educational background as categorical variable is used to measure whether the educated farmers may take place within each business type. It is expected to have a positive effect on attraction of dairy farming.

**X<sub>3</sub>: Dairy farmers with higher education level have positive effect on the attraction of dairy farming.**

##### Years of Experience in Dairy Production (yearofexprie)

Years of experience in dairy production is believed to be positively related with attraction of dairy farming. This is noted that with increase years of experience in dairy production, potential investor may be attracted to dairy farm investment (Dehinet et al., 2014).

**X<sub>4</sub>: Dairy farmers with years of experience in dairy production have positive effect on the attraction of dairy farming.**

##### Family Size of the Respondent (famsiz)

The family size indicated the number of persons in a family. It is assumed that if the family size is small in number, the flow of work sharing will be more across the members. Hence, the problems will arise when the family size would be less (Melesse et al., 2012).

**X<sub>5</sub>: The existences of more family size have a positive effect on the attraction of dairy farming.**

##### Religion of the Respondent (relig)

The religion in dairy production is believed to be positively related with attraction of dairy farming (Belay et al., 2012).

**X<sub>6</sub>: Any of the religion followers in dairy production have positive effect on the attraction of dairy farming.**

##### Marital Status of the Respondent (marstatu)

Marital status in dairy production is believed to be positively related with attraction of dairy farming. This is noted that married farmers have greater influence than that of the others (Belay et al., 2012).

**X<sub>7</sub>: Marital status in dairy farmers in dairy production has positive effect on the attraction of dairy farming.**

## **MICRO FACTORS**

### **Production (product)**

Efficient liquid milk collection, starting period of dairy production, milk production standards, effective quality control regulations and transaction variables are used as proxy for production to measure the dairy farm. These variables are reported to have significant impact on dairy farm investment (Shamsuddoha & Edwards, 2008).

**X<sub>8</sub>: When the dairy farm production increase income will increase, then have a positive relationship with attraction of dairy farming.**

### **Income (income)**

The total annual income is used as proxy for the income. It is reported to have significant impact on dairy farm investment (Belay et al., 2012).

**X<sub>9</sub>: When the dairy farm income increases, then have a positive relationship with attraction of dairy farming.**

### **Market (mkt)**

Cost of heifer and cow during adoption, and distance to market center are used as proxy for the market. These variables are reported to have significant impact on dairy farm investment (Tubetov et al., 2012).

**X<sub>10</sub>: If the dairy market is good or increased, then have a positive effect on the attraction of dairy farming.**

### **Technology (techno)**

National milk grid and processing plants, kid rearing systems, the use of a milking machine, adoption of different dairy technologies, feeding systems, cooling facility, mating system, and adoption of different dairy technologies are used as proxy for technology. These variables are found to have significant impact on dairy farm investment (Melesse et al., 2012).

**X<sub>11</sub>: When the dairy farmer applies more sophisticated dairy technologies, then have a positive effect to the attraction of dairy farming.**

### **Skilled Manpower (skimanpower)**

Type and percentage of farm labor allocated to livestock is used as proxy for skilled manpower. This variable is reported to have significant impact on attraction of dairy farm investment (Belay et al., 2012).

**X<sub>12</sub>: If there is availability of skilled manpower that operates the dairy farm, then have a positive impact for attraction of dairy farm.**

### **Health Care (healcar)**

Animal diseases, health care, availability of veterinarian /animal health service, lack of aggressive livestock disease control are used as proxy for health care of dairy farming. These variables are found to have significant impact on dairy farm investment (Getachew et al., 2012).

**X<sub>13</sub>: If there is an access to health care service for the dairy animals, then have a positive impact for attraction of dairy farm.**

### **Training Related (trairela)**

Extension service, access to research and training services, and access to dairy production extension service are used as proxy for availability of training services. These variables are found to have significant impact on attraction of dairy farm investment (Shamsuddoha & Edwards, 2008).

**X<sub>14</sub>: If there is accesses of training related to the dairy operation, and then have a positive impact for attraction of dairy farm.**

### **Distance (dist)**

Includes distance from output market and distance from input market which is the determinant factors for dairy farming investment and have a positive effect for attraction of dairy farm (Bryant, 2009).

**X<sub>15</sub>: Access to input and output market for the dairy farming have a positive impact for the attraction of dairy farm.**

### **Government Policies (govpoli)**

Remedies for market failure policy measures, marketing structure and trade policies, government policies and other interventions, government involvement in the development of dairy industry, and price-stabilizing policies are considered as proxy for government policies. These variables are found to have significant impact on attraction of dairy farm investment (Dehinet et al., 2014).

**X<sub>16</sub>: If the government policy is favorable for dairy farming investment, then have a positive effect on the attraction of dairy farming.**

### **Finance (finan)**

Access to credit service is used as proxy for finance. It is also reported as one of the significant factors that determine attraction of dairy farm investment (Dehinet et al., 2014).

**X<sub>17</sub>: If there is a good access to credit /finance/ for the dairy farmers/investors/, then have a positive effect on attraction of the dairy farm.**

### **Infrastructure (infastruc)**

Infrastructure is reported to have a significant impact on attracting dairy farm investment (Getachew et al., 2012).

**X<sub>18</sub>: If there is an access of infrastructure for facilitating the dairy operation, then have a positive impact for attraction of dairy farm.**

#### **Access to Operational Land (acceoperatland)**

Operational land holding is found out as one of the major determinant factors in dairy farm investment attraction (Dehinet et al., 2014).

**X<sub>19</sub>: If there is an access of operational land for facilitating the dairy operation, then have a positive impact for attraction of dairy farm.**

## **6. Data Analysis and Discussions**

This section presents, analyzes and interprets the data gathered from the respondents through structured questionnaire. The ordered logit regression model was used to analyze the effects of the explanatory variables on the attraction of the private dairy farm investment.

### **6.1. Characteristics of Sample Respondents**

According to Table 4 below;

- 35 (59 percent) of the surveyed respondents were smallholders, 19 (32 percent) cooperatives and the remaining 5(9 percent) were investors.
- 5 (8.47percent), 35 (59.32percent), and 19 (32.20 percent) of the surveyed dairy farmers were found within the age range of 18-35, 36-50, and 50 -80 years, respectively. Thus, most of the sampled dairy farmers (59.32 percent) were found within the age range of 36-50.
- Out of the total surveyed respondents (59), 48 (81.36 percent) were male and the rest 11 (18.64 percent) were female.
- Most of the respondents (86.44%) were married, 11.86 percent were single and 1.7% widowed.
- 2 (3.39 percent), 14 (23.73 percent), 27 (45.76 percent), 8(13.56 percent) and 8 (13.56 percent) of the sample respondents had an education level of illiterate, primary, secondary, preparatory (11-12), and TVET/Diploma, respectively.
- 30.51 percent of the dairy farmers had a family size of 5; 25.42 percent had a family size of 3; 23.73 percent had a family size of 4;11.86 percent , 5.085 percent and 3.39 percent had a family size of 1,2 and 7, respectively.
- 88.14 percent of the dairy farmers were Christians and the rest11.86 percent were Muslims.
- 22 (37.28 percent), 32(54.26 percent), and 5(8.46 percent) of the respondents had a work experience of <=5, 6-10, and >=11 years, respectively.



**Table 4. Characteristics of Sample Respondents**

Type of business	Number of investors	In percent (%)
Smallholders	35	59
Cooperatives	19	32
Investors	5	9
<b>Total</b>	<b>59</b>	<b>100</b>
Age	Frequency	Percent
18-35	05	8.47
36-50	35	59.32
50 -80	19	32.20
<b>Total</b>	<b>59</b>	<b>100</b>
Gender		
Male	48	81.36
Female	11	18.64
<b>Total</b>	<b>59</b>	<b>100</b>
Marital status		
Single	7	11.86
Married	51	86.44
Widowed	1	1.70
Divorced	0	0
<b>Total</b>	<b>59</b>	<b>100</b>
Education		
Illiterate	02	3.39
Primary	14	23.73
Secondary	27	45.76
Preparatory	8	13.56
TVET/Diploma	8	13.56
<b>Total</b>	<b>59</b>	<b>100</b>
Family Size(in number)		
1	7	11.86
2	3	5.08
3	15	25.42
4	14	23.73
5	18	30.51
7	2	3.39
<b>Total</b>	<b>59</b>	<b>100.00</b>
Religion		
Christian	52	88.14
Muslim	7	11.86
<b>Total</b>	<b>59</b>	<b>100.00</b>
Year of experience		
<=5	22	37.28
6-10	32	54.26
>=11	5	8.46
<b>Total</b>	<b>59</b>	<b>100.00</b>

Source: Own Result (2014)

## 6.2. Results, Analysis, and Discussions

This section deals with the analysis and interpretation of the ordered logistic regression results of the dependent variable (attraction of urban dairy farm investment) in relation to the explanatory variables (including gender, age, education, previous experience, family size, distance, initial capital, skilled man power, level of production, health, finance, technology, infrastructure, operational land, government policy, and market).

Table 5 below presents the ordered logistic regression results, i.e., shows the odd ratios (probability of dairy farm attraction/probability of not attraction), the p-value, and the marginal effect of explanatory variables included in the model.

**Table 5. Ordered Logistic Regression Estimation Result**

Ord Ordered logistic regression			Number of obs = 59
			Wald chi2(13) = 185.26
			Prob> chi2 = 0.0000
Log pseudo likelihood = -39.73378			Pseudo R2 = 0.2053
Over all attraction	Odd ratios results	P> z	Marginal effects (dy/dx) Result
<b>Demographic Factor</b>			
Age	.1893586	0.044**	.0753517
Sex	1.014637	0.850	-.000658
Year of Experience	1.054463	0.082***	.0024013
<b>Micro- Factors</b>			
Access to finance	6.767505	0.017**	.0454406
Health care service	13.34968	0.000*	.0574625
Skilled management	1.747468	0.509	.0211991
Training	11.38593	0.090***	.0524359
Distance	5.305682	0.019**	.0755629
Technology	1.031005	0.849	-.0013826
Market	1.87461	0.292	.0284542
<b>Macro- Factor</b>			
Infrastructure	.4395291	0.093***	.0372228
Operational Land	2.244454	0.176	-.0366075
Government policy	.671806	0.065***	.0180119

Source: Own Result (2014)

\*, \*\*, \*\*\* indicate level of significance at 1 percent, 5 percent and 10 percent, respectively.

### Hypotheses Testing

As indicated in Table 5 above, the numbers of observations of this study were 59 dairy investors. The other figure seen in the above table is p-value which is given as Prob>f = 0.000. This value is used to describe the reliability of a group of independent variables in predicting the dependent variable. If the p-value of the group of independent variable is less than 5 percent, they would reliably predict the dependent variable, whereas if the p-value is more than 5 percent, it would conclude that the groups of independent variables do not reliably predict the dependent variable (Gujarati, 2004).

Since the p-value of the group of independent variables (age, year of experience, training, access to finance, distance, market, operational land, infrastructure, technology, government) of this model is 0.0000 (i.e., Prob>chi<sup>2</sup>=0.0000) which is less than 5 percent, it is possible to conclude that they can reliably predict the dependent variable (overall investment attraction). From the above independent variables sex, manpower, technology, market and operational land were found insignificant factors in determining attraction of dairy farm investment.

As Table 5 above shows:

- From the demographic factors age, and year of experience were found significant as they have an estimated odds ratio of 0.1893586 with marginal effect of 0.0753517 (P-value of 0.044) and odds ratio of 1.054463 with marginal effect of 0.0024013 (P-value of 0.082), respectively.
- From the micro factors finance, health, training and distance were found significant in influencing the dependent variable (over all attraction of dairy farm investment) as they have an estimated odds ratio of 06.767505 with marginal effect of 0.0454406 (P-value of 0.017); odds ratio of 13.34968 with marginal effect of 0.0574625 (P-value of 0.000); odds ratio of 11.38593 with marginal effect of 0.0524359 (P-value of 0.090); and odds ratio of 5.305682 with marginal effect of 0.0755629 (P-value of 0.019), respectively.
- Furthermore, from the macro factors infrastructure and governmental policy were found significant in determining the overall attraction of dairy farm investment as they have an estimated odds ratio of 0.4395291 with marginal effect of 0.0372228 (P-value of 0.093) and odds ratio of 0.671806 with marginal effect of 0.0180119 (P-value of 0.065), respectively.

**X<sub>1</sub>: Older dairy farmer has a positive effect on the dairy farming because he/she is more experienced.**

Age was found statistically significant at 5 percent level. In line with the expectation, holding other factors constant, an old age investor are more attracted to dairy farm investment than the youngest one because they can own more experience than the young. The result indicates that an old age investors are more likely to have 0.19 times high attraction for the urban dairy farm investment. Besides, a respondent with each additional year of age is 7.54% more likely to be in high attraction to private urban dairy farm investment. The reasons as

to why older investors attracted to dairy farm than young investors are older investors are more experienced in dairy farming, they know the production, marketing, skilled and unskilled man power management and how to mobilize their finance.

Therefore, the first research hypothesis which says “*older dairy farmer has a positive effect on the dairy farming because he/she is more experienced*” is accepted at 5 percent significance level. This result is also similar to the findings of Belay et al. (2012), Dehinet et al. (2014), and Halak (2012) who found that older investors are highly attracted to the urban dairy farm investment than young investors.

**X<sub>2</sub>: Dairy farmers with years of experience in dairy production have positive effect on the attraction of dairy farming.**

Experience in dairy farm was found statistically significant at 10 percent level. In line with this expectation, holding other factors constant, experienced investors are more attracted to dairy farm investment than their counter parts. The result indicates that investors with high work experience are more likely to have 1.05 times high attraction to the urban dairy farm investment. Besides, a respondent with each additional year of experience is 0.24% more likely to be in high attraction to private urban dairy farm investment.

The possible reason as to why the investors having long work experience are attracted to dairy farm investment is that the investors can obtain more experience regarding the production, marketing, investment expanding, dairy management, and investors might be able to access complex and sensitive information about dairy investment.

Hence, the hypothesis “*dairy farmers with years of experience in dairy production have positive effect on the attraction of dairy farming*” is accepted at 10 percent significance level. The result is consistent with the findings of Belay et al. (2012) who reported that investors with higher year of work experience are highly attracted to dairy farm investment.

**X<sub>3</sub>: If there is a good access to credit /finance/ for the dairy farmers/investors/, then have a positive effect on attraction of the dairy farm.**

Access to finance for dairy farm was found statistically significant at 5 percent. In line with this expectation, access to finance has a positive relation with dairy farm attraction, other factors held constant. The result indicates that investors who have access to finance are more likely to have 6.77 times high attraction to the urban dairy farm investment. Besides, a respondent with a unit increase in access to finance is 4.5% more likely to be in high attraction to private urban dairy farm investment. The possible reason as to why the investors having access to finance are attracted to dairy farm investment is that the investors can obtain more capital to perform the dairy farming so that investors might be able to perform the dairy farm investment.

Therefore, the hypothesis “*if there is a good access to credit /finance/ for the dairy farmers/investors/, then have a positive effect on attraction of the dairy farm*” is accepted at 5 percent significance level. The result is consistent with the findings of Dehinet et al. (2014), Halak (2012), Sikawa and Mugisha (2012), and VanEngelen (2011) who found that investors with access to finance are more likely attracted to dairy farm investment.

**X<sub>4</sub>: If there is an access to health care service for the dairy animals, then have a positive impact for attraction of dairy farm.**

Access to health care service for dairy animals was found statistically significant at 1 percent. In line with this expectation, access to health care service for dairy animals has a positive relation with dairy farm attraction, other factors held constant. The result indicates that those who have access to health care service for dairy animals are more likely to have 13.34 times high attraction to the urban dairy farm investment. Besides, a respondent with a unit increase in access to health care service is 5.75% more likely to be in high attraction to private urban dairy farm investment. The possible reason as to why the investors having access to health care service are attracted to dairy farm investment is that the investors can have a healthy and more productive cows and the business firm becomes profitable.

Therefore, the hypothesis “*if there is accesses to health care service for the dairy animals, then have a positive impact for attraction of dairy farm*” is accepted at 1 percent significance level. The result is consistent with the findings of Getachew et al. (2012) who have reported that investors with access to health care service for the dairy farm animals are more likely attracted to dairy farm investment.

**X<sub>5</sub>: If there is accesses of training related to the dairy operation, and then have a positive impact for attraction of dairy farm.**

Training was found statistically significant at 10 percent level. The result indicates that those who have access to training are more likely to have 11.39 times high attraction to the urban dairy farm investment. Besides, a respondent with a unit increase in access to training is 5.24% more likely to be in high attraction to private urban dairy farm investment, other factors held constant. This implies that there may be difference in operating the dairy farming among investors due to training provided by government bodies, NGOs or privates participating in dairy farm in terms of increasing the production of milk and milk products, and the management skill of the farm and increasing the business profitability.

Therefore, the research hypothesis which says “*if there is accesses of training related to the dairy operation and then have a positive impact for attraction of dairy farm*” is accepted at 10 percent level of significance. The result is consistent with the previous empirical evidences of Halak (2013), and Shamsuddoha and Edwards (2008) who found that training is the most determinant factor to the dairy farm investors to improve their production and management skill in their business and, thus, training is one factor for the attraction of urban dairy farm investment.

**X<sub>6</sub>: Short distance travels to input and outputs for the dairy farming have a positive impact for the attraction of dairy farm.**

Distance was found statistically significant at 5 percent level of significance. It refers to the short distance that investors travel for access to input and output market of the dairy farming. In line with the expectation, the shortest distance to dairy input and output market has a positive relation with private dairy farm investment, other factors held constant. This implies that the shortest distance, the cheapest cost of transportation, and the higher profit.

The result indicates that those who travel short distance for input and output market are more likely to have 5.31 times high attraction to the urban dairy farm investment. Besides, a respondent with a unit decrease in distance to input and output market is 7.6% more likely to be in high attraction to private urban dairy farm investment, other factors held constant.

As a result, the hypothesis which states “*short distance travels to input and outputs for the dairy farming have a positive impact for the attraction of dairy farm*” is accepted at 5 percent significance level. The finding is similar with the findings of Dehinet et al. (2014) which stated that availability of input dairy farm ingredients and output market at a short distance have a main role on the attraction of dairy farm investment.

**X<sub>7</sub>: If there is an access of infrastructure for facilitating the dairy operation, then have a positive impact for attraction of dairy farm. .**

Infrastructure was found to have a positive relation with dairy farm investment attraction and is statistically significant at 10 percent. Infrastructure refers to the road, telecommunication, electric power, and water.

The result indicates that those who have access to infrastructure are more likely to have 0.44 times high attraction to the urban dairy farm investment. In addition, a respondent with a unit increase in access to infrastructure is 3.72% more likely to be in high attraction to private urban dairy farm investment, other factors remain constant.

Thus, the hypothesis which states “*if there is an access of infrastructure for facilitating the dairy operation, then have a positive impact for attraction of dairy farm*” is accepted at 10 percent significance level. The finding is similar with the findings of Getachew et al. (2012), and Shamsuddoha and Edwards (2008) who stated that access to infrastructure is one of the basic determinant factors for attraction of dairy farm investment.

**X<sub>8</sub>: If the government policy is favorable for dairy farming investment, then have a positive effect on the attraction of dairy farming.**

Government policy was found statistically significant at 10 percent level. This implies that a favorable government policy is positively correlated with dairy investment attraction because favorable government policy creates an enabling business environment to invest in dairy farming.

The result indicates that those who have an access to favorable government policy are more likely to have 0.67 times high attraction to the urban dairy farm investment. Moreover, a respondent with a unit increase in access to good government policy is 1.8% more likely to be in high attraction to private urban dairy farm investment, other factors held constant.

Therefore, the research hypothesis which says “*if the government policy is favorable for dairy farming investment, then have a positive effect on the attraction of dairy farming*” is accepted at 10 percent level of significance. The result is consistent with the previous empirical evidences of Halak (2012), and Shamsuddoha and Edwards (2008) who stated that favorable government policy has a significant role on the attraction of dairy farming.

## **7. Conclusion and Recommendation**

This section presents the conclusions drawn based on the research findings and recommendations forwarded based on the conclusions followed by limitation of the study and suggestions for further research as well as the managerial implications.

### **7.1 Conclusions**

The ordinal logistic regression model was done to analyze the determinants for the attraction of dairy farm investment. Among the thirteen explanatory variables which were hypothesized to be the significant determinant factors for the attraction of dairy farm investment, eight of them (age, year of experience, access to finance, health care service, training, distance, infrastructure and governmental policy) were found to be statistically



significant at 1 percent, 5 percent, and 10 percent levels of significance. But, the remaining five variables (sex, skilled manpower, technology, market and operational land) were found statistically insignificant factors.

Dairy farm inputs were generally scarce, far from where the dairy farmers are and too expensive. The respondents stated that breed, breed centers, and veterinary services which are particularly crucial for the success of dairy farming were not made available. The most important constraints with respect to breed were lack of breed, non-availability of insemination centers, and veterinary services on time. Besides, the development of infrastructure, access to finance, technology and operational land were poor. Thus, they are exposed to unnecessary expenses, waste of time, and incur travel costs. As per the interview result, some of the farmers had dairy farm oriented training and had gained experiences in workshops, and majority of the respondents had contact with dairy extension agents.

## 7.2 Recommendations

During the survey, the study has identified several challenges faced by the members of the dairy farmers in getting inputs, marketing outputs and factors that determine the overall attractiveness of the dairy farm business. Accordingly, the following recommendations are forwarded in order to address the inhibiting factors thereby to make the dairy farm investment more attractive.

Age had marginal effect of 0.075, i.e., the probability of attraction of urban dairy farm investment increases by 7.5 percent for an additional year increases in the age of the farmer. This determines at what age is the dairy farm attractive for investors. According to the data obtained, the attraction age is ranged from 37-42 year, which means the age below and above this range is not high attractive. Therefore, the following recommendations should be considered by the investors, responsible regional offices, and stakeholders:

- Young investors should get relevant training and experience sharing from the more experienced and successful investors.
- Government may recruit the young individuals in similar job till they are equipped and confident to perform their own dairy farm investment.
- Government may carry out trade fair or support the dairy farmers to carry out trade fairs in their area of business for enhancing idea, knowledge, and technology transfer.

Year of experience had marginal effect of 0.0024, i.e., the probability of attraction of urban dairy farm investment increases by 0.24 percent for an additional year increase in farm experience. This implies that investors relatively with more year of experience in dairy farm investment are more attracted to dairy farming. Therefore, the following recommendations should be considered by the investors, responsible regional offices and stakeholders:

- Ensure increased participation of the dairy farmers by involving them in planning, execution and monitoring of dairy marketing activities.
- Improve management skills of dairy farm investors by conducting regular refresher training programs to be organized by the government and/or by the investors themselves.
- Organize seminars that benefit dairy farmer's productivity and also conduct experience sharing tours and workshops.

Access to finance had marginal effect of 0.045, i.e., the probability of attraction of urban dairy farm investment increases by 4.5 percent for a unit of increase in access to finance. This implies that access to finance is among the crucial factors in dairy farm attraction. Therefore, the following recommendations should be considered by the investors, responsible regional offices and stakeholders:

- Make arrangements by government and credit institutions to provide easy access to credit for dairy farm investors.
- Dairy farm investors should be honored in loan repayment.
- Dairy farm investors should apply the money taken from finance institutions only for expansion and development of their dairy farm business.

Health care service had marginal effect of 0.057, i.e., the probability of attraction of urban dairy farm investment increases by 5.70 percent for a unit of increase in dairy health care service. This indicates that access to health care service is the other factor in dairy farm attraction. Therefore, the following recommendations should be considered by the investors, responsible regional offices and stakeholders:

- Train the dairy farmers to manage first aid treatments.
- Make arrangements for effective veterinary services and regular visits by dairy experts to the livestock farms and/or as needed by the dairy farmers.
- As the government clinic doesn't fully address to all dairy investors, government should develop and promote private veterinarian associations that provides house to house medical service to dairy farmers.

Training had marginal effect of 0.052, i.e., the probability of attraction of urban dairy farm investment increases by 5.20 percent for a unit of increase in training. This implies that training is the other factor in dairy

farm attraction. Therefore, the following recommendations should be considered by the investors, responsible regional offices and stakeholders:

- Dairy farmers may get training on how they promote the cultivation of fodder grass which may be practiced in their farms or near to their farm.
- Dairy farmers should initiate to start units for butter, milk powder, ghee and yogurt.
- Dairy farmers should focus their attention on regular and effective milk collection, pasteurization, storage and distribution systems
- Dairy based agribusiness may be promoted by the dairy farmers through the members with the help of relevant organizations in the region.
- Through effective linkage with international livestock organizations and other livestock agencies, make regular arrangements for popularization of exotic breeds such as Holstein and cross bred cattle that produce more milk.

Distance had marginal effect of 0.076, i.e., the probability of attraction of urban dairy farm investment increases by 7.60 percent for a unit of decrease in distance. This signifies that distance is the other factor in dairy farm attraction. If investors get an access for input and output around their farm, it leads the dairy farmers to be profitable and attractive. Therefore, the following recommendations should be considered by the investors, responsible regional offices and stakeholders:

- The government should arrange a feasible market premises at fair rate and should be easily accessible.
- The dairy farmers should jointly form factories that produce fodder in order to avoid long distance travel to find inputs.
- Dairy farmers may promote cultivation of fodder grass in their farms or near to their farm. Thus, government should avail them with sufficient land.

Infrastructure had marginal effect of 0.037, i.e., the probability of attraction of urban dairy farm investment increases by 3.70 percent for a unit of increase in access to infrastructure. This implies that access to infrastructure is one of the determinant factors in dairy farm attraction. Therefore, the following recommendations should be considered by the investors, responsible regional offices and stakeholders:

- As much as possible the government should fulfill at least the basic infrastructures such as electricity, water and road services.
- The investors should contribute in the expansion of infrastructures made by the government.
- The investors should properly use and protect (safe) from damages the infrastructures around their business for their sustainability.
- Make improvements in the dairy marketing infrastructure such as provision of processing plants, storage facilities and transportation of dairy products.

Government policy had marginal effect of 0.018, i.e., the probability of attraction of urban dairy farm investment increases by 1.80 percent for a unit of improvement in government policy in favor of dairy farmers. This signifies that government policy is one of the determinant factors in dairy farm attraction. Therefore, the following recommendations should be considered by the investors, responsible regional offices and stakeholders:

- The government should ease and make friendly the bureaucratic process in service delivery to the existing, new and ongoing dairy business investors.
- The government should ease its policy on licensing, land provision, credit finance, etc for dairy farm investment and should develop an incentive package to retain the existing dairy farmers and attract new dairy farm investors.
- The ongoing dairy investors should give constructive comments to respective offices for the improvement and attractiveness of the urban dairy farm investment.
- The responsible office should communicate and make regular meetings with the dairy farmers for the development of urban dairy farm investment.

### 7.3 Limitations and Suggestions for Future Research

Urban dairy farming plays vital role in serving healthy and pure milk and milk products to the society. The sector also plays pivotal role in poverty alleviation and unemployment reduction in Ethiopia. However, there may be many factors besides the factors that are analyzed in this study which hinder the ability of the sector to attract and retain urban dairy farm investors. In an attempt to study the urban dairy farm investment in Mekelle city, Tigray, this study has gone some steps forward.

This study has revealed relevant findings regarding the attractiveness of the urban dairy farming and factors affecting them in Mekelle city, Tigray. However, it has not addressed all urban dairy farmers in the Tigray region. These study findings may not be used to generalize about the determinants of the urban dairy farm investment because the study has focused on only the dairy sector in the Mekelle city. The study has only through a light on the factors that determine urban dairy farm investment attraction.

Therefore, there is a need for large scale and in depth studies to discern factors affecting the

attractiveness of urban dairy farm investment in other part of Tigray region, thereby to develop appropriate strategies for the development and attraction of urban dairy farm investment in Tigray.

#### 7.4 Managerial and Research Implications

Urban dairy farming is important for poverty reduction and creating employment opportunity especially in developing countries like Ethiopia by solving their financial problems of those who participate in dairy farming business. There are a number of determinant factors that affect the urban dairy farm investment attraction. Analyzing such factors and devising an appropriate solution is essential to expand the activities of dairy farm in a sustainable manner. Thus, this study is significant to Mekelle City Investment Office, concerned governmental agencies, as well as other researchers who will conduct their studies on similar thematic areas. Additional lessons learned from these urban dairy farms could be applied for the betterment of others in the Tigray region or in the nation.

**Mekelle City Investment Office:** The study analyzed the impact of the major determinant factors of urban dairy farm investment attraction and forwarded possible recommendations that the institution should adopt for attracting dairy farm investors.

**Government/Donors:** The study may be used by government and other concerned bodies as an input for taking corrective measures that aim at improving urban dairy farm investment attraction.

**Other researchers:** The study provides invaluable information for other researchers, who may be interested to identify and analyze the determinants of urban dairy farm investment attraction.

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